Medical Science

Effect of smartphone addiction on sleep quality among medical students at Taibah University, Medina, Saudi Arabia

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ABSTRACT

Background: Smartphone is a double-edged sword since its addiction has a lot of negative effects on health as it will affect sleep quality, eating behaviors, exercise, and academic performance. This study aims to find out the prevalence of smartphone addiction using a validated scale which is Smartphone Addiction Proneness Scale-short version (SAPS) and evaluate the effect of smartphone usage on sleep quality among medical students at Taibah University, Medina, Saudi Arabia during 2020. *Methodology:* An analytic cross-sectional study with a self-administrated questionnaire was conducted on medical students at Medical Collage, Taibah University. A self-administrated questionnaire was used to collect data using the PUMP scalefor smartphone addiction. Sleep quality was assessed using PSQI. *Results:* Total number of participants is 312, 44.2% of the participants were males. 31.4% of the participants use smartphone for 1-5 hours, 50% (n=156) use it for 6-8 hours, 10.3% use it for 9-10 hours, and 8.3% use it for more than 10 hours. Using PUMP scale; 46.6% of the participants were smartphone addicts) while 53.4% weren't smartphone addicts). Using the PSQI; we found poor sleep quality in 41.7% of smartphone users and good sleep quality in 58.3%. *Conclusion*: Smartphone addiction is readily growing along with the increased need for its usage, this addiction is particularly harmful as it affects many aspects in one's life especially negatively affecting sleeping quality both in a direct way and in an indirect way.

Keywords: smartphone, addiction, sleep quality, medical students, Taibah University, Saudi Arabia

1. INTRODUCTION

To have the world in the palm of your hand" is famous idiom used to describe smartphones. They work like a portable computer that small in size, can be carried everywhere, and by them we gratify our compulsion at any moment. Smartphones make access to education, social media, work, and entertainment applications easier and convenience. So, in these days they become increasingly crucial in everyday life and their use has dramatically increased over recent decades. People become spending most of their time in using

smartphone and not pay attention to other aspects of life. This led to an emersion of smartphone addiction phenomena .According to WHO, addiction defined as "continuous use of something for the sake of relief or stimulation, which often causes cravings when it is absent (WHO, 2020). Furthermore, smartphone addiction has similar aspects to DSM-5 substance-related disorders in these four domains: compulsive behavior, functional impairment, withdrawal, and tolerance (Lin et al., 2015).

Smartphone users have become so dependent on it. Without their smartphones they feel inadequate and useless. Moreover, the most modern phobia is nomophobia which is abbreviation for no-mobile-phone phobia. It's referred to illogical terror of being deprived of your smartphone or being incapable to use it in some circumstances like, absence of network or empty battery. One of the biggest commercial company do a survey which include thousands of people found that 9 out of 10 people "felt panic" when their battery reaches 20% or lower (Bhattacharya et al., 2019).

Saudi Arabia ranked 3rd in the world, among Saudi population 72.8% of them are using smartphones (Abolfotouh et al., 2019). Recent studies show that prevalence of smartphones addiction in Saudi Arabia is high. One of these studies conducted in 2019 among medical students at Qassim University found that out of 242, 146 have smartphone addiction (60.3% (Alsalameh et al., 2019). Smartphone is a double-edged sword since smartphone addiction has a lot of negative effects on health as it will affect levels of energy, sleep quality, eating behaviors, body weight, exercise, and academic performance. It's also a risk influence for psychological health illnesses as depression, anxiety. So WHO, consider smartphone addiction as an important community health problem (Gao et al., 2016).

This study will focus on the effect of smartphone addiction on sleep quality. Sleep plays an essential role in brain and other body systems functions like metabolism, appetite regulation, immune, hormonal, and cardiovascular systems. It's a vital concern that is vital for optimal health (Watson et al., 2015). Despite its common usage, "Sleep quality" is a term without a clear definition (Libman et al., 2016). The term has different meanings from one person to other. In repetition, deprived sleep quality is presented as one of sleep characteristics of insomnia either: difficult getting to sleep or staying asleep or poor sleep efficiency (Edinger et al., 2004). In adding, bad sleep quality linked with reduced daytime working (Lemola et al., 2013). It has been shown in the literature that smartphones addiction meaningfullylinked with deprived sleep quality. Many studies conducted in Saudi Arabia to examine the effect of smartphone addiction on sleep quality.

A study done in Jeddah, enrolled 610 participates, all participants had smartphones, 73.4% of them used their smartphone for more than 5 hours per day and 68.4% of them had poor sleep quality. It concluded with that smartphone dependency was allied to bad sleep quality, and sleep latency (Ibrahim, 2018). Recent cross-sectional study from Riyadh done on Saudi non-medical staff in 2019 found that 9 out of 10 use their smartphones at bed time and 41.7% of participants have poor sleep quality (Alshobaili & AlYousefi, 2019). Recent study from Jouf published in November 2019 examined the relationship between sleep quality, using social media platforms, and academic achievementof students. It included 412 university students and concluded that "Most college scholarshurt from bad quality of sleep. The often used social networking platforms are WhatsApp, Snapchat and YouTube. The strongest predictor of precise bad sleep quality was Twitter addiction (Abu-Snieneh et al., 2020).

Researches from different parts of the world show the same results. A cross sectional study published in 2017 conducted on high school students, Korea found that smartphone addiction users showed earlier sleep times and more sleep deprivation than normal users with statistical significance (P<0.001) (Wang et al., 2019). Another cross-sectional study done in India in 2016 found that out of 587 subjects, 195 (33.3%) were high users of smartphone and they have a highest global PSQI scores in comparison to none-low smartphone users (Kumar et al., 2019). Older study done on medical students of HIHT University, India concluded that smartphone use for more than 2 hours will lead to deprived sleep and reduced sleep periods (Yogesh et al., 2014).

Another study from India published in October, 2019 on medical students from rural medical college; Maharashtra found that out of 220 adults aged between 18-25 years old and those who were using smartphone for more than 3 years. 54% were found to be addicted to smartphone. The sleep quality in these individuals was poorer than non-addicted users (Sonawane et al., 2019). A cross-sectional from Turkey done on students of the Sakarya University at 2013 show that sleep quality worsens with increasing smartphone addiction level (p < 0.05) (Sahin et al., 2013).

In comparison to the older generation, young under-graduate generations have been grown up in this smartphones revolution and integrate these devices into their lifestyle (Roberts et al., 2014). This made them more vulnerable to develop smartphone addiction. Unfortunately, they are also have high stages of stress from studying and demands of modern life. All these circumstances increased their need to time make them cutting back on sleep and lead to poor sleep quality (Brand & Kirov, 2011). So, Good sleep quality is critical part of students' life.

There is a limited research in this area among medical students in Medina. Thus, this study was conducting with an aim to find out the effect of smartphone addiction on sleep quality in medical scholars of Tibah University.

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General objective

To find out the prevalence of smartphone addiction using a validated scale which is Smartphone Addiction Proneness Scale-short version (SAPS) and evaluate the effect of smartphone usage on sleep quality among medical students at Taibah University, Medina, Saudi Arabia during 2020.

2. METHODOLOGY

Study design

A non-experimental analytic cross-sectional study with a self-administrated questionnaire was used to implement this study.

Study population

The target population is medical students of both genders in all levels at Medical Collage, Taibah University, Al Madinah Al Munawarah. The author will approach students via a self-administrated questionnaire.

Study period

From January 2020 to September 2021

Inclusion criteria

-All medical students at Medical Collage, Taibah University

-Female and male.

-Aged between 18–26 years.

-Possession of a smartphone for more than 6 months.

-Ability to communicate and fill out the questionnaire.

Exclusion criteria

Presence of mental illness or sleep disorder as diagnosed by a physician;

Working at night;

Having children;

Failure to complete the questionnaire

Sample size

All levels of medical students and both gender at Taibah University who meet the inclusion criteria was included.By using Raosoft, the following was calculated:

Population size = 757 (378 are male, 379 are female) Sample size = 256

Confidence level = 95%

Confidence interval (margin of error) = 5% Response rate was calculated.

Sampling techniques

The author used stratified sampling method in this study and will stratify population by these 3 stages:

Stage 1: stratifying population by sex (male, female) taking half number from each gender (128 participants)

Stage 2: stratifying population by levels into 7 levels and take equal numbers of participants from each level as possible (18 from 1st year, 18 from 2nd year, 18 from 3rd year, 18 from 4th year, 18 from 5th year, 19 from 6th year, 19 from intern).

Stage 3: Choose participants from level wasrandomly by taking every 3rd students from students list

Study tool

This study uses a multiparts self-administrated questionnaire based on the study objectives to assess the following:

A) Study population demographic characteristic (age, gender, and year of study).

B) Smartphone addiction using the problematic use of mobile phones (PUMP) scale: this scale was developed by Bianchi and Phillips (Bianchi & Phillips, 2005). It's a 20-item questionnaire that assesses mobile phone use based on the DSM-5 criteria for substance use disorder (Merlo et al., 2013). The respondents answered each PUMP scale question on a Likert-type scale. All items were rated on a 5-point scale ranging from 1 = "strongly disagree" to 5 = "strongly agree." The higher scores mean higher mobile

phone addiction levels.A validity and reliability study in Arabic was done and permission was taken from the author to use it (Alosaimi et al., 2016).

C) Sleep quality was assessed using PSQI. It is a self-administrated questionnaire that assesses sleep quality over a 1-month time interval. The measure consists of 19 individual items, creating 7 components whichare (1) subjective sleep quality, (2) sleep latency, (3) habitual sleep efficiency, (4) sleep duration, (5) sleep difficulties, (6) daytime functional impairment, and (7) use of sleeping pills. In order to calculate the total score of the questionnaire, each question well be assigned a score from 0 to 3. If the total score is equal or more than 5, it means poor sleep quality and if it is less than 5, it means good sleep quality. PSQI will take 5-10 minutes to complete it. A validity and reliability study in Arabic was done after permission from the author (Suleiman et al., 2010).

Data entry and analysis

Data was collected by hand and was entered in SPSS by double entry method to analyze it using appropriate statistical tests. To say the results are statistically significant P-value must be <0.05.

Pilot study

To test for applicability and feasibility of this questionnaire, time taking to finish one questionnaire, and the process of conducting this study.

Ethical considerations

The study is self-funded. There is no conflict of interests. The questionnaire will include a letter guarantee the confidentiality and anonymity of participants and letter clearly indicates that participation was voluntary and without any direct or indirect effect, in addition contributors have the choice to dismiss their participation. Only the information required for this study was collected and they wasused for the purpose of this study.

Also, the questionnaire involved contact information for author to allow participants to ask any question related to the study. The proposal was submitted to research ethics committee of the general directorate of the health affairs of Madinahto get approval. So we obtained the ethical approval with letter (IRB 173-2021).

3. RESULTS

According to table 1, total number of participants is 312, and by grouping them according to their sociodemographic characteristics we assess the following: according to age subdivision, 6.4% (n=20) of the respondents aged less than 20 years, 92.3% (n=288) aged between 20-25 years, and 1.3% (n=4) aged between 26-30 years; where 44.2% (n=138)of the contributors were males and 55.8% (n=174) of the contributors were females. According to education level (academic year) statistical data, 1.3% (n=4) of the participants were in their first year, 11.5% (n=36) were in the second year, 18.6% (n=58) were in the third year, 22.4% (n=70) were in the fourth year, 10.9% (n=34) were in the fifth year, 7.1% (n=22) were in the sixth year, and finally 28.2% (n=88) were in the year of privilege. According to the social status, 93.6% (n=292) of the participants were single and 6.4% (n=20) only were married. In table 2, academic GPA before using the smartphone was as follows: 2.6% (n=8) of the participants achieved 'Good', 19.9% (n=62) achieved 'Very good', and 77.6% (n=242) achieved 'Excellent'. Current academic GPA was: 1.3% (n=4) of the participants achieved 'Acceptable', 9.6% (n=30) achieved 'Good', 36.5% (n=114) achieved 'Very good', 52.6% (n=164) achieved 'Excellent'.31.4% (n=98) of the participants use it for 1-5 hours, 50% (n=156) use it for 6-8 hours, 10.3% (n=32) use it for 9-10 hours, and 8.3% (n=26) use it for more than 10 hours.

Table 1 Sociodemographic features of contributors (n=312)

Parameter		No.	Percent
age	Less than 20	20	6.4
	20 - 25 years old	288	92.3
	26 - 30 years old	4	1.3
education level	First year	4	1.3
	Third Year	58	18.6
	Second Year	36	11.5
	fifth year	34	10.9
	the fourth year	70	22.4

	Sixth year	22	7.1
	the year of privilege	88	28.2
Gender	Male	138	44.2
	Female	174	55.8
Social status	Single	292	93.6
	Married	20	6.4

Table 2 GPA before and after using the smartphone andperiod and number of hours per day spent using smartphone (n=312).

		No.	Percent
Academic GPA before using the smartphone:	Good	8	2.6
	very good	62	19.9
	excellent	242	77.6
Current Academic GPA:	Acceptable	4	1.3
	Good	30	9.6
	very good	114	36.5
	excellent	164	52.6
Time start using the smartphone	1 -5 years	26	8.3
	6 -10 years	142	45.5
	More than 10 years	144	46.2
Hours per day spent using smartphone	5 -1	98	31.4
	8 -6	156	50.0
	10 - 9	32	10.3
	More than 10	26	8.3

According to table 3, sleep hours have decreased after using smartphone, and their answers were recorded as follows: 12.8% (n=40) of the participants strongly disagree, 22.4% (n=70) disagree, 28.2% (n=88) were neutral, 19.2% (n=60) agree, and 17.3% (n=54) strongly agree. We also asked them if they noticed an increase in their weight after using the smart phones: 7.1% (n=22) strongly disagree, 17.9% (n=56) disagree, 20.5% (n=64) were neutral, 20.5% (n=64) agree, 34% (n=106) strongly agree. Participants were asked if using smartphones negatively affected their academic achievement: 10.9% (n=34) strongly disagree, 23.1% (n=72) disagree, 23.1% (n=72) were neutral, 20.5% (n=64) agree, and 22.4% (n=70) strongly agree. Table 4 and figure 1 show PUMP scale mean score as 77.9%, 146 of the participants (46.6%) scored higher than mean value while 167 of the participants (53.4%) scored lower.

Table 3 responses of the respondents to smartphone addiction using the problematic use of mobile phones (PUMP) scale items

	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
After using your smartphone, have you noticed that your sleep hours have decreased?	12.8	22.4	28.2	19.2	17.3
After using your smartphone, did you feel less energetic the next day?	22.4	27.6	20.5	21.2	8.3
After using your smartphone, are you eating more fast food than before?	12.8	25.6	25.0	17.9	18.6
After using your smartphone, have you noticed an increase in your weight?	7.1	17.9	20.5	20.5	34.0
After using your smartphone, does it affect your academic achievement negatively?	10.9	23.1	23.1	20.5	22.4
After using your smartphone, do you exercise less than before?	10.9	17.9	27.6	20.5	23.1
I don't feel completely satisfied when I reduce the time I spend on my mobile.	8.3	14.7	26.3	26.9	23.7

To satisfy my desire, I have been using my mobile for a longer period of time than in the past	17.9	27.6	21.2	18.6	14.7
When I stop using my cell phone, I get moody and irritable.	7.7	12.8	21.8	24.4	33.3
It's hard for me emotionally to give up my mobile	28.8	26.3	14.1	16.7	14.1
The time I spend on my mobile prevents me from doing other important work	27.6	30.1	21.2	9.6	11.5
I used to think that it was unnatural to spend as much time as I do now on mobile.	29.5	28.8	17.9	18.6	5.1
I think I'm spending too much time on my mobile right now	44.2	28.2	14.1	9.0	4.5
Others tell me that I spend too much time on my mobile	17.9	18.6	24.4	21.8	17.3
If I am not using the mobile, then I am considering or planning to use it.	17.9	35.3	21.2	14.1	11.5
I get nervous when a period of time goes by when I haven't received any call or message	10.3	12.8	18.6	14.7	43.6
I've been ignoring the people around me because of my mobile phone	12.2	16.0	16.0	23.7	32.1
I have used the mobile before knowing that I have to do some academic work or homework instead	39.1	28.2	12.8	10.3	9.6
I've used a cell phone before and I know I have to go to sleep.	55.8	27.6	10.9	2.6	3.2
When I stop using the phone because of its negative impact on my life, I often go back to using it again	22.4	32.1	27.6	12.8	5.1
I got in some trouble at work or college because of my mobile phone	10.9	10.9	19.9	20.5	37.8
Sometimes, I find myself using my mobile instead of spending time with people who are important in my life and want to spend time with me	19.9	26.9	17.3	17.3	18.6
I've used a mobile before and I know it's dangerous to do s	18.6	23.7	18.6	18.6	20.5
I almost got into an accident because of my mobile phone.	8.3	11.5	13.5	16.7	50.0
My use of mobile has already caused problems in my relationship with someone	4.5	10.9	18.6	16.0	50.0
I kept using the phone even when someone asked me to stop using it	12.8	16.7	23.1	12.2	35.3

Table 4 smartphone addiction using the PUMP scale

Mean Score	77.9±11.2	
Higher than mean (smartphone addict)	146	46.6%
Lower than mean (not smartphone addict)	167	53.4%

Table 5 illustrates that; 12.8% who strongly disagreed that their sleeping hours decreased after using smartphone 6.1% used smartphones for 1-5 hours, 15.4% used them for 6-8 hours, 25% used them for 9-10 hours, and 7.7% used them for more than 10 hours. Of the participants 22.4% who disagreed, 24.5% used smartphones for 1-5 hours, 17.9% used them for 6-8 hours, 25% used them for 9-10 hours, and 38.5% used them for more than 10 hours. Of the participants 28.2% (n=88) who were neutral, 32.7% used smart phones for 1-5 hours, 29.5% used them for 6-8 hours, 0% for using them 9-10 hours, and 38.5% used them for more than 10 hours.

Table 6 and figure 2 shows the sleep quality; using the PSQI among smartphone users. Total score is equal or more than 5, means poor sleep quality in 41.7% of smartphone users and it is less than 5, means good sleep quality in 58.3%. Of the participants 19.2% who agreed, 24.5% used smart phones for 1-5 hours, 17.9% used them for 6-8 hours, 18.8% used them for 9-10 hours, and 7.7% used them for more than 10 hours. Of the participants 17.3% who strongly agreed, 12.2% used smart phones for 1-5 hours, 19.2% used them for 6-8 hours, 31.3% used them for 9-10 hours, and 7.7% used them for more than 10 hours (Table 7).
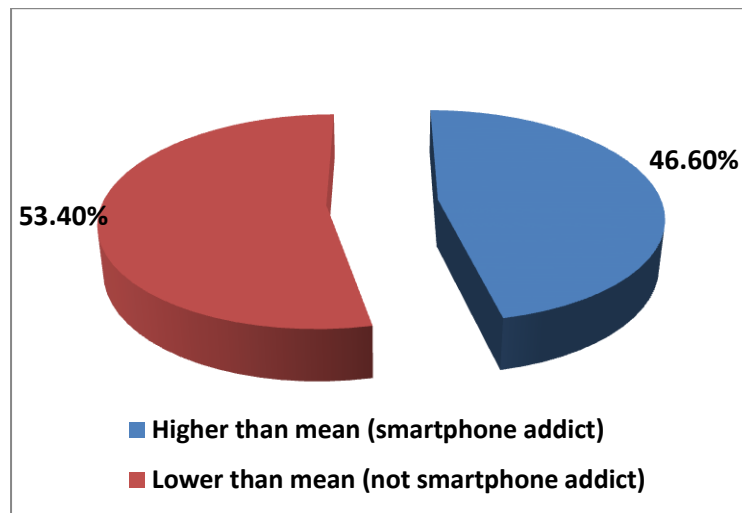

Figure 1 smartphone addiction using the PUMP scale

**Table 5** responses of the respondents to Pittsburgh Sleep Quality Index (PSQI)

Parameter		No.	Percent
Time to go to bed at night over the last month	12 – 2AM	122	39.1
	3 – 5 Am	58	18.6
	6 – 8 Am	40	12.9
	9- 11 Am	12	3.9
	2 – 12 Bm	30	9.6
	6 - 3Bm	6	1.9
	8 – 7Bm	6	1.9
	9 - 11 Bm	38	12.2
Minutes usually taken to fall asleep each nightover the last month	20 -11	90	28.8
	30 - 21	78	25.0
	40 -31	6	1.9
	60 -41	36	11.5
	10 - 5	80	25.6
	More than 60	22	7.1
Time to get out of bed in the morning over the last month	12 – 2 AM	10	3.2
	3 – 5 Am	50	16.1
	6 – 8 Am	106	33.9
	9 - 11 Am	46	14.7
	12 – 2 Bm	42	13.4

	3 - 6 Bm	52	16.6
	7 – 8 Bm	6	1.9
Hours actually sleep each night over the last month	Less than 5	34	10.9
	5-10	242	77.6
	11-15	32	10.3
	16 and over	4	1.3
Rate overall sleep quality over the last month	fairly good	170	54.5
	very good	80	25.6
	somewhat bad	26	8.3
	Very bad	36	11.5
Over the past month, how big a problem to maintain enough enthusiasm to get things done	Just a simple problem	94	30.1
	somewhat problematic	108	34.6
	very big problem	40	12.8
	No problem at all	70	22.4
Bed partner or share a room	roommate not bed	142	45.5
	bed partner	18	5.8
	partner in another room	2	6.
	No partner in bed or no room sharing	150	48.1
Any discomfort during sleep	Neck pain or headache	2	6.
	Muscle pain	2	6.
	I think I'm not reaching the deep sleep stage and getting enough sleep	2	6.
	Pain in the bones	2	6.
	Waking up at the slightest sound, anxiety, anger when waking up	4	1.3
	Frequent awakening after three hours of sleep	2	6.
	Waking up frequently from an uncomfortable mattress	2	6.
	The heat in the summertime, I think, makes sleep not of sufficient quality.	2	6.
	Significantly interrupted sleep, cannot sleep for 4	2	6.

	hours straight		
	My back hurts sometimes	4	1.3
	When you wake up, there is drowsiness	2	6.
	block	2	6.
	Sometimes I sleep intermittently	2	6.
	Respiratory problems due to chronic sinusitis	2	6.
	nothing	2	6.
	Neck pain or headache	2	6.
	Muscle pain	274	87.8

Table 6 sleep quality using the PSQI (N=312)

Total Score	No.	%
≥5 (poor sleep quality)	130	41.7%
≤5(good sleep quality)	182	58.3%
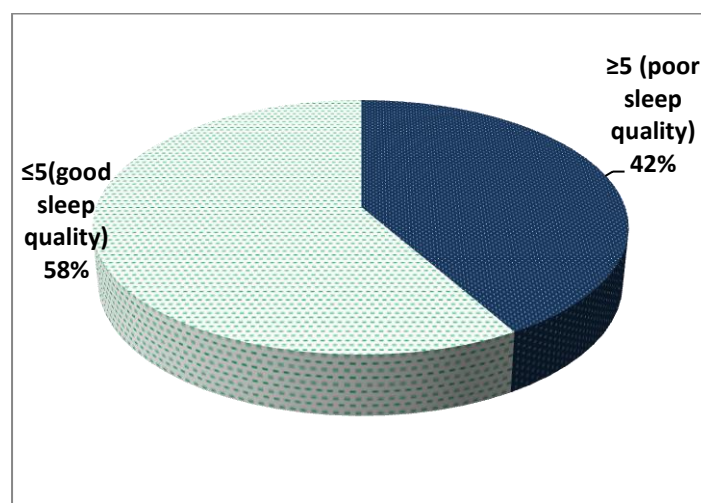
Figure 2 sleep quality using the PSQI among smartphone users

Table 7 frequency of every type of sleep disturbance among smartphones users in the past month

	Less than once a week	Three or more times a week	Once or twice a week	Not once in the past month
Can't fall asleep in 30 minutes	88 / 28.2	62 / 19.9	94 / 30.1	68 / 21.8
Waking up in the middle of the night or in the morning	92 / 29.5	74 / 23.7	66 / 21.2	80 / 25.6
Get up to go to the bathroom	90 / 28.8	58 / 18.6	54 / 17.3	110 / 35.3
Can't breathe comfortably	48 / 15.4	18 / 5.8	32 / 10.3	214 / 68.6
Coughing or loud snoring	36	8	12	256

	11.5	2.6	3.8	82.1
Feeling very cold	60	28	56	168
	19.2	9.0	17.9	53.8
Feeling too hot	78	44	54	136
	25.0	14.1	17.3	43.6
Have bad dreams	106	38	74	94
	34.0	12.2	23.7	30.1
Feeling pain	60	18	42	192
	19.2	5.8	13.5	61.5
Prescription or nonprescription medications to help you sleep over the past month	28	6	268	10
	9.0	1.9	85.9	3.2
Trouble staying awake while driving, eating meals, or engaging in social activities over the past month	62	14	196	40
	19.9	4.5	62.8	12.8
Snoring loudly	22	8	272	10
	7.1	2.6	87.2	3.2
Long pause between breaths during sleep	16	0	284	12
	5.1	0	91.0	3.8
Man is quiet while sleeping	40	12	248	12
	12.8	3.8	79.5	3.8
Bouts of confusion during sleep	32	12	254	14
	10.3	3.8	81.4	4.5

4. DISCUSSION

The usage of smartphones nowadays is growing rapidly as they are considered from the most powerful communication devices. Smartphones had become an essential and everyday the number of cellular subscriptions is increasing. This increase is associated with the increased demands of life, and as the life demands are increasing we will always see an increasing use of smartphones. New Time Mobility Poll stated in 2012 that 84% people can't go a day deprived of their mobiles (Parasuraman et al., 2017). And this poll bring us to talk about smartphone addiction, where Saudi Arabia is ranked the 3rd in the world in using smartphones 72.8% of the population are using smartphones (Abolfotouh et al., 2019). This discussion will stress on the occurrence of smartphone addiction using a validated scale, and evaluate the effect of smartphone usage on sleep quality among medical students at Taibah University, Medina, Saudi Arabia during 2020.

According to our results; there was a negative effect of smartphones on academic GPA. A study conducted among 688 undergraduate students from Notre Dame University, Lebanon; the study showed that the relation between the academic GPA and Smartphone Addiction Inventory (SPAI) Scale was not significant (Matar Boumosleh and Jaalouk, 2017). Regarding daily number of hoursof smartphone by the participants, we will notice that 31.4% (n=98) of the participants use it for 1-5 hours, 50% (n=156) use it for 6-8 hours, 10.3% (n=32) use it for 9-10 hours, and 8.3% (n=26) use it for more than 10 hours. This is relatively high compared to the statistics of smartphones usage per day (in hours) of an online study among Malaysian population (409 participants participated in the study), which shows that of the participants, 64.3% (n=263) used smartphones for less than 1 hour, 19.1% (n=78) used smartphones less than 2 hours, 13.4% (n=55) used smartphones less than 3 hours, and 3.2% (n=13) used smartphones more than 3 hours (Parasuraman et al., 2017).

In the current study, mean score was 77.9%, and it was higher than the mean score in 146 of the participants (46.6%) but lower than mean in 167 of the participants (53.4%). Another study conducted in municipality town of West Bengal, the results showed mean Smartphone Addiction Scale score was 102.85, while the lowest score was 52, and the higher score was 167 (Ghosh et al., 2021). A cross-sectional survey conducted in Wuhu, China, among 2639 junior school students; the results showed that there was an increasing g body weight along with the increase in smartphone usage and poor sleep, as in 518 students having poor sleep quality, 98.1% had smartphone addiction (Kumar et al., 2019). When comparing the results of our study about the effect of using

smartphones on quality of sleep with those of other studies we found that: A study among a sample of 409 Malaysian participants to study the mobile phone addiction behavior and awareness on electromagnetic radiation (EMR), showed that 16.9% (n=69) of the participants strongly agree that they think that smartphones usage causes sleep disturbances, 57.7% (n=236) agree, 21.3% (n=87) disagree, and 4.1% (n=17) strongly disagree (Parasuraman et al., 2017).

Another survey made on a large scale in UK found that 61.6% of the survey respondents had poor sleep quality and 68.7% in the respondents with smartphone addiction, and from the results conducted from the respondents with smartphone addiction around 70% reported poor sleep quality while less than 69% had poor quality of sleep amongst those without smartphone addiction (Dworak et al., 2007). A cross sectional study carried among 150 medical students, revealed that among respondents with smartphones addiction, 77.6% (n=52) reported poor quality of sleep and 22.4% (n=15) reported good quality of sleep, while in respondents without smartphone addiction, 30.1% (n=25) had poor quality of sleep and 69.9% (n=58) had good quality of sleep, expressing a significant relation (P= <0.001) (Kumar et al., 2017).

5. CONCLUSION AND RECOMMENDATIONS

Smartphone addiction is readily growing along with the increased need for its usage; unfortunately this addiction is particularly harmful as it affects many aspects in one's lifeespecially negatively affecting sleeping quality both in a direct way and in an indirect way. Further investigation and studies should be done on a larger and more varying scale as results of different studies are controversial and also to find out a way how to decrease the intensity of addiction to decrease the harm that falls on a person's life. Also, more awareness needs to be paid off to explain to people the potential harm of smartphone addiction.

Informed consent
Informed consent was obtained from all participants included in the study.

Author Contributions
All the authors contributed evenly with regards to data collecting, analysis, drafting and proofreading the final draft.

Conflict of Interest
The authors declare that there are no conflicts of interests.

Data and materials availability
All data associated with this study are presented in the paper.

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